

**REMARKS**

Claims 1-15 and 35-36, and new claims 39-43, are pending in the application. Claims 1-29 and 35-38 have been rejected. Claims 30-34 were previously withdrawn from consideration. Claims 6 and 12 have been amended, claims 16-34 and 37-38 have been canceled, and claims 39-43 have been added, to more particularly point out and distinctly claim the subject matter of the present invention. The Specification and Drawings have been amended to correct inadvertent minor errors. Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

Attached hereto as Appendix A is a separate sheet with a clean copy of the pending claims as amended by this amendment. Attached hereto as Appendix B is a marked-up version of the changes made to the specification and claims by the current amendment, pursuant to 37 CFR § 1.121 and MPEP § 714. In particular, the Specification has been amended to correct inadvertent typographical and minor errors. Figs. 1-5 have also been amended, by way of a separate cover sheet attached hereto in accordance with MPEP § 608.02(R) to propose amendment of the drawing. The reference numerals and related legends have been amended in Figs. 1-5 for consistency with the reference numerals utilized in the text of the Specification. No new matter has been added.

Claims 16-34 and 37-38 have been canceled, and new dependent claims 39-43 have been added, which depend variously from the two remaining independent claims 1 and 35. Claims 6 and 12 have been amended to correct inadvertent minor errors.

On page 2 of the Office Action, the Examiner rejected claims 2-3, 17-18, and 21 under 35 U.S.C. § 112(2), for indefiniteness, because  $y$  is not defined in a measurable value or range in the similar manner as is the value of  $x$  defined. Rejected claims 17-18, and 21 have been canceled. Applicant notes that the subscripts in these claims are mole fractions, where the paired fractions  $x$  and  $1-x$ , on the one hand, and  $y$  and  $1-y$ , on the other hand, each total 1.0 (100%), as is understood by those skilled in the art.

For 1.3 or 1.55  $\mu\text{m}$  wavelength VCSELs based on the substrate of the present invention, and employing the  $\text{In}_x(\text{Al}_y\text{Ga}_{1-y})_{1-x}$  material system,  $x$  preferably ranges from about 15% to about 45%, as

claimed in some of the dependent claims directed to such an embodiment. See, e.g., Specification, page 10, lines 1-15. However, Applicant did not choose to not limit the range of  $y$  for this claimed embodiment, as is Applicant's right. Because  $y$  is not limited in the claims, it can range from about 0% to about 100%. Applicant is not required to restrict  $y$  to a narrower range. Accordingly, Applicant submits that Applicant need not amend the claims to restrict  $y$  to a narrower range, as was done with  $x$ . Further, Applicant submits that the claims need not be amended to state what is already clearly implied in the formula  $\text{In}_x(\text{Al}_y\text{Ga}_{1-y})_{1-x}$ , namely,  $y$  is between 0% and 100%. Applicant therefore respectfully submits that claims 2-3 are not indefinite, and that the indefiniteness rejection based on § 112(2) should be withdrawn. By the same token, new dependent claim 41 is also not indefinite.

On pages 2-6 of the Office Action, the Examiner rejected claims under 35 U.S.C. § 102(e) as being anticipated by Hwang et al., U.S. Pat. No. 6,406,795.

Applicant however submits that the pending claims, as amended, are not anticipated by Hwang et al., for the following reasons. In particular, both pending independent claims 1 and 35 specify the use of an interfacial bonding layer disposed between a base substrate and a thin film adaptive crystalline layer, where the interfacial bonding layer is *solid at approximately room temperature, and in liquid-like form when above room temperature*. Also, the thin film adaptive crystalline layer has a degree of flexibility to expand or contract its lattice constant along a direction parallel to a surface of the substrate *when the interfacial bonding layer is in liquid-like form*. As explained in the Specification (see, e.g., pages 8-12, particularly the subsection captioned "Floating Substrate Approach", and Figs. 2-3), such a substrate can be used as an alternative substrate for the formation of various devices with special target epi material systems, such as approximately 1.2  $\mu\text{m}$  to approximately 1.8  $\mu\text{m}$  wavelength VCSELs. The target material system can have a lattice constant different from that of the thin film adaptive layer, because, during epi growth of the target epi layers on the thin film adaptive layer, the interfacial bonding layer is floating due to the above-room-temperature temperatures employed. The adaptive thin film layer, even though it has a lattice constant different from that of the target epi material system, has a sufficient degree of lattice

flexibility during epitaxial growth of the target material system, due to the presence of the floating interfacial bonding layer. This permits the lattice constant of the adaptive thin film layer to adjust to that of the target system, thereby providing lattice match and reducing lattice mismatch threading dislocations.

The use of a "floating" interfacial bonding layer—i.e., which is solid at approximately room temperature, and in liquid-like form when above room temperature—is simply not taught in the Hwang reference. There is no suggestion whatsoever that the bonding interface 16 of Hwang et al. is solid at approximately room temperature, and in liquid-like form when above room temperature; nor that a thin film adaptive crystalline layer is disposed on the interfacial bonding layer and having a degree of flexibility to expand or contract its lattice constant along a direction parallel to a surface of the substrate when the interfacial bonding layer is in liquid-like form. These features are simply not taught in Hwang et al. Accordingly, Applicant submits that independent claims 1 and 35 are not anticipated by Hwang et al., and that the § 102(e) rejection should be withdrawn and independent claims 1 and 35, and their variously-dependent claims, should be placed in condition for allowance.

Applicant notes that the present Application and the application that matured into the Hwang et al. patent were and are owned by the same entity (namely, Applied Optoelectronics, Inc.). Accordingly, by virtue of 35 U.S.C. § 103(c), the Hwang et al. reference cannot preclude patentability under 35 U.S.C. § 103, because it is (at most) available as prior art only under 35 U.S.C. § 102(e).

The Assistant Commissioner for Patents is hereby authorized to charge any additional fees or credit any excess payment which may be associated with this communication to our deposit account 50-1705.

In view of the foregoing remarks and amendments, claims 1-15 and 35-36, as variously amended, and new claims 39-43, are believed to be in condition for allowance. Allowance of the pending claims at an early date is earnestly solicited.

The undersigned may be contacted for any questions.

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Respectfully submitted,

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